



Ricardo  
Energy & Environment

## QAQC Report for the Automatic Urban and Rural Network, April-June 2018

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Report for the Environment Agency  
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## Executive summary

Ricardo Energy & Environment carries out the quality assurance and quality control (QAQC) activities for the Automatic Urban and Rural Monitoring Network (AURN) on behalf of the Environment Agency (EA), the UK Department for Environment, Food and Rural Affairs (Defra), the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland.

This quarterly report summarises the QAQC activities carried out over the period 1<sup>st</sup> April 2018 to 30<sup>th</sup> June 2018. It presents the key data capture and data quality statistics, and highlights any issues that have been identified relating to the monitoring stations and their apparatus. The number of AURN monitoring stations in operation during part or all of this period was 170.

During this quarter, the spring 2018 intercalibration exercise was carried out, involving calibration of every ozone analyser in the network. This allows the accuracy of the measured results to be determined, and a measurement uncertainty for each analyser to be calculated, as required by the Data Quality Objectives of the European Union's Air Quality Directive (2008/50/EC).

The data from each analyser in the network have been ratified by the QAQC Unit using documented and validated methods. This process takes into account input from Local Site Operator (LSO) calibrations, the QAQC audits and records from Equipment Support Unit (ESU) activity.

The routine QAQC procedures have included checking of particulate analyser baselines for some time now. The CEN standard method for ambient particulate matter EN16450 states that action must be taken when baseline response is higher than  $3 \mu\text{g m}^{-3}$  but does not state what the action should be. Up to the 2015 dataset the only agreed action was to delete the data. However, as part of ongoing improvement activities a protocol has been agreed to enable baselines to be corrected where baseline responses exceed  $\pm 3 \mu\text{g m}^{-3}$ . Accordingly, baseline correction – where it is deemed appropriate – has now been incorporated into the data ratification protocols.

Data ratification for the quarter was completed by the deadline of 30<sup>th</sup> September 2018. The mean data capture for ratified hourly average data was 94.37% (averaged over all pollutants O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>), for the three-month reporting period April-June 2018.

The data capture target of the Air Quality Directive is 90% excluding periods of planned maintenance e.g. calibrations, audits and servicing). An allowance of 5% is made for this, hence a target of 85%. Mean data captures for individual pollutants were as follows: CO 98.40%, NO<sub>2</sub> 95.38%, O<sub>3</sub> 97.95%, SO<sub>2</sub> 90.65%, PM<sub>10</sub> 90.54%, and PM<sub>2.5</sub> 94.45%. Hence, the mean data captures for all pollutants met this target in Quarter 2 (Q2) of 2018. Principal reasons for data loss are given here for stations which fail to make the 90% data capture target for the quarter.

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# 1 Introduction

## 1.1 Background

The UK Automatic Urban and Rural Network (AURN) has been established to provide information on air quality concentrations throughout the UK for a range of pollutants. The primary function of the AURN is to provide data in compliance with the Air Quality Directive 2008/50/EC<sup>1</sup>. In addition, the data and information from the AURN are required by scientists, policy makers and planners to enable them to make informed decisions on managing and improving air quality for the benefit of health and the natural environment.

A number of organisations are involved in the day-to-day running of the network. Currently, the role of Central Management and Co-ordination Unit (CMCU) for the AURN is contracted to Bureau Veritas, whilst the Environmental Research Group (ERG) of King's College London (KCL) has been appointed as Management Unit (MU) for the AURN monitoring stations that are also part of the London Air Quality Network (LAQN), together with a small number of others in the south of England. Ricardo Energy & Environment undertakes the role of Quality Assurance and Control Unit (QAQC Unit) for all stations within the AURN. The responsibility for operating individual monitoring stations is assigned to local organisations with relevant experience in the field under the direct management (and contract to) CMCU. The people within these organisations who carry out the operation of the monitoring stations are referred to as Local Site Operators (LSOs). Calibration gases for the network are supplied by Air Liquide Ltd and are provided with an ISO17025 certificate of calibration by Ricardo Energy & Environment. The monitoring equipment is serviced and maintained by a number of Equipment Support Units, under contract to the CMCU or the station owner in the case of Local Authority-owned affiliated stations.

Dissemination of the data from the AURN via UK-AIR (the UK online Air Information Resource, <http://uk-air.defra.gov.uk>) and other media such as social media and freephone services, is undertaken by the Data Dissemination Unit (DDU). A summary report of the data is also published annually in the "Air Pollution in the UK" series of reports, which can be found at <https://uk-air.defra.gov.uk/library/annualreport/index>.

A total of 170 monitoring stations at 168 locations in the AURN operated during this quarter. The total of 170 includes two stations where Partisol gravimetric particulate samplers are co-located with automatic particulate analysers. For data processing purposes the gravimetric sampler is treated as a separate station; and they are shown, and counted, separately in the data capture tables in section 3.

## 1.2 What this Report Covers

This report covers the three-month period April-June 2018, or "Quarter 2" (Q2) of the year. This report covers the main QAQC activities and a summary of the significant station operational issues.

The main reasons for any data loss at the stations have been provided. These were predominantly due to instrument or air conditioning faults, response instability or problems associated with the replacement of analysers and infrastructure.

## 1.3 Where to Find More Information

Further information on the AURN can be found in the following:

- UK-AIR, [www.uk-air.defra.gov](http://www.uk-air.defra.gov) which contains information on individual stations along with real-time hourly data, graphs and statistics.

## 1.4 Changes to the Network during this Quarter

Table 1-1 shows the changes that were made to the network during the period April-June 2018:

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<sup>1</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF>

**Table 1-1 Network Changes April-June 2018**

Station	Pollutants	Date Added
<b>Monitoring Stations Started Up:</b>		
Cardiff Newport Road	NO <sub>2</sub> PM <sub>10</sub>	16/04/18
Dewsbury Ashworth Grove	NO <sub>2</sub>	14/05/18

In addition, the Network Upgrade Programme involved the following changes this quarter:

- Introduction of the replacement PM<sub>2.5</sub> particulate analyser at London Westminster, which went live to the network on 16<sup>th</sup> April.
- Introduction of the replacement PM<sub>10</sub> particulate analyser at Narberth, which went live to the network on 20<sup>th</sup> June. The replacement Fidas instrument measures both PM<sub>10</sub> and PM<sub>2.5</sub> and it was decided to disseminate both metrics to the data dissemination unit for visibility in UK-AIR.
- Introduction of the replacement PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at Newport, which went live to the network on 20<sup>th</sup> June. The replacement Fidas instrument measures both PM<sub>10</sub> and PM<sub>2.5</sub> and it therefore not only replaced the fully funded FDMS PM<sub>2.5</sub> but also the Local Authority owned FDMS PM<sub>10</sub>.
- Introduction of the replacement BAM PM<sub>10</sub> and PM<sub>2.5</sub> particulate analysers at Grangemouth, which went live to the network on 20<sup>th</sup> June 2018.

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## 2 Methodology

### 2.1 Overview of QAQC Activities

The QAQC activities consist of the following key parts:

- QAQC audits of all analysers in the network every six months (three months for ozone).
- Ratification of the data on a three-monthly basis, and delivery of ratified data to the Data Dissemination Unit for dissemination via UK-AIR and other routes.
- Assessment of new station locations in conjunction with the CMCU, and assessment of compliance with the siting criteria in the Directive.
- Investigation of instances of suspected poor-quality data.

During this quarter, the spring intercalibration exercise was conducted on the ozone analysers in the network.

### 2.2 Overview of Data Ratification

Data for each station are supplied monthly by the CMCUs. Once initial monthly data files have been received, checked and loaded into Ricardo's MODUS data processing system, the process of data ratification begins. This process is required to refine data scaling based on all the calibration and audit data available, and to identify, withdraw or flag anomalous data due to instrument or sampling faults or where data fall outside the Uncertainties or Limits of Detection defined by the Data Quality Objectives (DQOs) of Directive 2008/50/EC (the Air Quality Objective) and the European Union's Implementing Provisions for Reporting.

## 3 Data Ratification Results

### 3.1 Data Capture – Network Overview

#### 3.1.1 Overall Data Capture

The overall data capture for the period April-June 2018 is given in Table 3-1. The data capture target of the Air Quality Directive is 90% excluding periods of planned maintenance (e.g. calibrations, audits and servicing). An allowance of 5% is made for this, hence the target of 85% also shown in the table. Note that data capture figures are correct at time of writing (October 2018) and are subject to change.

**Table 3-1 Data Capture Summary, April-June 2018 (Quarter 2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Number of Stations	7	157	75	76	78	27	170
Number of stations < 85 %	0	9	2	12	6	5	15
Number of stations < 90%	0	10	3	15	12	7	21
Average	98.40	95.38	97.95	90.54	94.45	90.65	94.37

Average data capture was at least 85% for all pollutants.

#### 3.1.2 Generic Data Quality Issues

In some cases, the ESU may choose to avoid significant data loss by removing an instrument for workshop repair, and install a temporary loan instrument in station. This is termed a “hotspare” analyser. This may not be of the same type of analyser, which has implications for LSO calibration procedures, and also for the reporting of instrument types in the annual data submission.

### 3.2 Data Capture and Station-Specific Issues - England (Excluding Greater London)

A summary of data capture for England for April-June 2018 is given in Table 3-2:

**Table 3-2 Data Capture for England, April-June 2018 (Quarter2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Barnsley Gawber		99.73	99.82			99.68	99.74
Barnstaple A39				0.00	88.74		44.37
Bath Roadside		99.82					99.82
Billingham		99.59					99.59
Birkenhead Borough Road		99.91					99.91
Birmingham A4540 Roadside		99.59	99.77	92.67	90.34		95.59



Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Birmingham Acocks Green		92.58	99.95		100.00		97.51
Blackburn Accrington Road		95.28					95.28
Blackpool Marton		95.65	99.86		99.86		98.46
Borehamwood Meadow Park		94.55					94.55
Bournemouth		99.82	99.91		98.90		99.54
Bradford Mayo Avenue		99.08					99.08
Brighton Preston Park		99.50	98.81		93.41		97.24
Bristol St Paul's		99.95	99.91	99.40	99.73		99.75
Bristol Temple Way		99.73		96.61			98.17
Burton-on-Trent Horninglow		99.91					99.91
Bury Whitefield Roadside		99.59		97.66			98.63
Cambridge Roadside		98.49					98.49
Cannock A5190 Roadside		96.98					96.98
Canterbury		99.04	77.79				88.42
Carlisle Roadside		95.60		94.46	88.97		93.01
Charlton Mackrell		99.82	99.91				99.86
Chatham Roadside		98.03		99.31	99.45		98.93
Chesterfield Loundsley Green		95.38		96.34	99.91		97.21
Chesterfield Roadside		91.48		98.31	98.44		96.08
Chilbolton Observatory		98.90	99.63	95.19	94.78	99.31	97.56
Christchurch Barrack Road		99.22			99.18		99.20
Coventry Allesley		95.74	99.86		99.68		98.43
Coventry Binley Road		99.63		99.27			99.45
Derby St Alkmund's Way		99.82					99.82
Dewsbury Ashworth Grove		94.28					94.28

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Doncaster A630 Cleveland Street		99.68					99.68
Eastbourne		0.00			99.77		49.89
Exeter Roadside		99.73	99.86				99.79
Glazebury		100.00	97.02				98.51
Hartlepool St Abbs Walk		99.91					99.91
High Muffles		99.91	99.95				99.93
Honiton		99.91					99.91
Horley		76.74					76.74
Hull Freetown		99.91	99.91		99.95	99.63	99.85
Hull Holderness Road		99.68		99.73			99.70
Immingham Woodlands Avenue		49.86					49.86
Ladybower		99.82	30.27			95.60	75.23
Leamington Spa		75.92	99.59	99.91	99.77		93.80
Leamington Spa Rugby Road		97.34		84.29	83.61		88.42
Leeds Centre	99.86	99.82	98.81	100.00	100.00	99.22	99.62
Leeds Headingley Kerbside		99.91		99.22	99.82		99.65
Leicester A594 Roadside		99.86		99.95			99.91
Leicester University		99.68	99.86		100.00		99.85
Leominster		98.63	99.86				99.24
Lincoln Canwick Road		99.73					99.73
Liverpool Speke		99.86	99.95	89.74	99.73	99.36	97.73
Lullington Heath		99.31	99.68			99.22	99.40
Luton A505 Roadside		99.63					99.63
Manchester Piccadilly		99.82	99.73		99.63	99.68	99.71
Manchester Sharston		99.86	98.67				99.27
Market Harborough		95.70	99.91				97.80
Middlesbrough		99.59	99.91	90.11	99.68	98.35	97.53
Newcastle Centre		84.57	88.74	85.16	85.26		85.93

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Newcastle Cradlewell Roadside		99.82		97.02			98.42
Northampton Spring Park		98.49	97.48		97.76		97.91
Norwich Lakenfields		99.86	99.95	95.79	99.91		98.88
Nottingham Centre		97.25	97.30	97.16	92.63	89.01	94.67
Nottingham Western Boulevard		99.54		99.86			99.70
Oldbury Birmingham Road		98.81					98.81
Oxford Centre Roadside		95.38					95.38
Oxford St Ebbes		99.77		99.54	99.77		99.69
Plymouth Centre		99.18	99.77	99.77	95.97		98.67
Plymouth Tavistock Road		91.85					91.85
Portsmouth		99.91	99.82	94.92	91.03		96.42
Portsmouth Anglesea Road		92.35		99.63			95.99
Preston		99.86	99.86		96.20		98.64
Reading London Road		95.51		92.67			94.09
Reading New Town		99.86	99.91	98.99	96.61		98.84
Rochester Stoke		96.84	98.63	97.30	97.39	83.61	94.75
Salford Eccles		99.63		99.54	99.86		99.68
Saltash Callington Road				66.03	96.25		81.14
Sandy Roadside		98.49		41.71	44.46		61.55
Scunthorpe Town		98.17		99.95		98.72	98.95
Shaw Crompton Way		93.18					93.18
Sheffield Barnsley Road		92.99			95.88		94.44
Sheffield Devonshire Green		99.27	99.86	99.86	99.86		99.71
Sheffield Tinsley		96.70					96.70
Sibton			99.91				99.91
Southampton A33		99.82		53.80			76.81

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Southampton Centre		97.62	99.73	55.45	100.00	99.54	90.47
Southend-on-Sea		97.16	98.63		80.04		91.94
St Helens Linkway		99.73		98.35			99.04
St Osyth		98.35	99.82				99.08
Stanford-le-Hope Roadside		99.50		96.75	99.91		98.72
Stockton-on-Tees A1305 Roadside		98.95			99.31		99.13
Stockton-on-Tees Eaglescliffe		99.36		99.13	99.27		99.25
Stoke-on-Trent A50 Roadside		96.52		96.57			96.54
Stoke-on-Trent Centre		97.57	97.80		96.75		97.37
Storrington Roadside		99.86					99.86
Sunderland Silksworth		95.38	95.47		91.76		94.20
Sunderland Wessington Way		95.56					95.56
Swindon Walcot		99.91					99.91
Telford Hollinswood		84.39					84.39
Thurrock		97.34	97.57	96.38		92.81	96.03
Walsall Woodlands		99.91	99.82				99.86
Warrington		74.04		74.50	73.76		74.10
Weybourne			99.77				99.77
Wicken Fen		98.58	99.86			81.09	93.18
Widnes Milton Road		0.00					0.00
Wigan Centre		99.59	99.91		92.90		97.47
Wirral Tranmere		99.59	99.86		99.86		99.77
Worthing A27 Roadside		99.77			97.39		98.58
Yarner Wood		99.95	98.81				99.38
York Bootham		98.81		99.91	99.27		99.33
York Fishergate		96.98		96.52	99.91		97.80
Number of Stations	1	107	49	46	52	15	111

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	All
Number of stations < 85 %	0	8	2	7	4	2	11
Number of stations < 90%	0	8	3	9	7	3	14
Average	99.86	95.12	97.28	90.53	95.24	95.66	94.02

The following station-specific issues were identified:

#### **Barnstaple A39**

The FDMS data continued to suffer due to temperature effects this quarter, but the PM<sub>10</sub> was affected worst, The PM<sub>10</sub> data for the whole of Q2 have been deleted.

#### **Canterbury**

A communications problem with the site was observed by CMCU on 3<sup>rd</sup> April. The LSO was unable to restore communications, and the matter handed to BT for investigation. This did not result in a solution, and it was decided to replace the modem. The procurement process resulted in a delay, and the new equipment was not installed until 21<sup>st</sup> May. The data was subsequently downloaded, but due to the limited memory capacity of the ozone analyser, data from 3<sup>rd</sup> to 21<sup>st</sup> April had been lost.

#### **Carlisle Roadside**

The PM<sub>2.5</sub> data from 12<sup>th</sup> to 22<sup>nd</sup> June were deleted due to very noisy data resulting from a leak in the main flow.

#### **Eastbourne**

The LSO was unable to carry out calibrations from December 2017 up to the summer QAQC audit. As the Air Quality Directive requires calibrations at least 3-monthly, NO<sub>x</sub> data from the winter service on 20<sup>th</sup> February to the summer audit on 18<sup>th</sup> July.

#### **Horley**

A change in NO<sub>x</sub> analyser response from 10<sup>th</sup> June (zero baseline becomes noisy) with a step change in calibration span/sensitivity between LSO calibrations 4<sup>th</sup> June and 18<sup>th</sup> June (approx 10%). An ESU callout on 24<sup>th</sup> July revealed a leak in the converter. Data from 10<sup>th</sup> to 30<sup>th</sup> June (and into July) have been deleted.

#### **Immingham Woodlands Avenue**

Following a callout on 16<sup>th</sup> May, a clear change in profile of NO<sub>x</sub> data was observed. The ESU noted that internal sampling would have been possible. Data have been deleted back to 16<sup>th</sup> January.

#### **Ladybower**

An ESU callout to the O<sub>3</sub> instrument on 11<sup>th</sup> June in response to a flow fault found a blockage in the sample lines. Data from 7<sup>th</sup> April to 11<sup>th</sup> June have been deleted.

#### **Leamington Spa**

Following problems with autocal run-on, the ESU replaced the site NO<sub>x</sub> analyser with a hotspare on 26<sup>th</sup> April to 16<sup>th</sup> May. This gave spuriously high data, which were deleted during ratification.

#### **Leamington Spa Rugby Road**

Both FDMS analysers gave a period of spurious noisy data in early May, but both recovered at the LSO visit on 15<sup>th</sup> May. The LSO noted the hut temperature was high as the air conditioning was not working correctly.

#### **Liverpool Speke**

The PM<sub>10</sub> appears anomalously low for the period 15<sup>th</sup> to 26<sup>th</sup> June, and not in line with other local sites. These data have been deleted.

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**Newcastle Centre**

The power supply tripped on 27th April. On reset, the air conditioning would not restart, and a revisit did not repair the fault successfully. The station was switched off to avoid damage. Air conditioning was restored on 11<sup>th</sup> May and monitoring of all pollutants restarted.

**Nottingham Centre**

An ESU callout on 10<sup>th</sup> April in response to excessively high SO<sub>2</sub> readings being observed. This was a result of lamp and detector faults. Data from 4<sup>th</sup> to 10<sup>th</sup> April have been deleted.

**Rochester Stoke**

On 8<sup>th</sup> April the ESU were alerted to a fault with the SO<sub>2</sub> analyser causing high, spurious data. Due to access issues within the school grounds the ESU was not able to attend the call out until 13<sup>th</sup> April. The engineer cleaned valves and replaced the sample pump but the following day CMCU requested a repeat visit due to continuing concern over the data. The engineer returned on 17<sup>th</sup> April to conduct the 6-monthly service and reported that the analyser was contaminated with calibration span gas from the permeation tube. The analyser was purged and cleaned, and satisfactory monitoring resumed upon service completion on 18<sup>th</sup> April. All available data over this period were deleted.

**Saltash Callington Road**

The PM<sub>10</sub> volatile concentrations were not consistent with other stations for the period 1<sup>st</sup> to 23<sup>rd</sup> April, and so the PM<sub>10</sub> data for this period have been deleted.

**Sandy Roadside**

There were frequent periods of spurious data for both FDMS analysers during the quarter due to ineffective station cooling. These analysers were turned off around 16<sup>th</sup> June to avoid damage.

**Southampton A33**

The volatile PM<sub>10</sub> data contained frequent spikes throughout the quarter. The air conditioning performance was noted as being poor during the period. The PM<sub>10</sub> data have been deleted from 7<sup>th</sup> May to 4<sup>th</sup> June, and from 18<sup>th</sup> to 30<sup>th</sup> June.

**Southampton Centre**

The volatile PM<sub>10</sub> data was very noisy from 11<sup>th</sup> May to 21<sup>st</sup> June, when quality significantly improves following a filter change. The PM<sub>10</sub> data for this period have been deleted.

**Southend-on-Sea**

The air conditioning at Southend-on-Sea performed poorly early in the quarter, and the PM<sub>2.5</sub> FDMS was switched off from 18<sup>th</sup> April to 4<sup>th</sup> May.

**Telford Hollinswood**

There was a sampling fault between LSO calibrations on 3<sup>rd</sup> and 17<sup>th</sup> April. These NO<sub>x</sub> data have been deleted.

**Warrington**

A period of spurious elevated NO<sub>x</sub> data was observed from 17<sup>th</sup> May to 9<sup>th</sup> June. This may be due to elevated station temperatures caused by poor air conditioning performance. The PM<sub>2.5</sub> and PM<sub>10</sub> data are also noisy and of poor quality over the same period. All data have been deleted for this period.

**Wicken Fen**

The SO<sub>2</sub> data was particularly noisy from 1<sup>st</sup> to 18<sup>th</sup> May, and have been deleted. This site has a history of noisy SO<sub>2</sub> data.

**Widnes Milton Road**

The CMCU approached the LSO and ESU on numerous occasions following the loss of communication with the analyser on 18<sup>th</sup> April but the Local Authority no longer wishes to spend any more time in attempting to resolve the recurring instrument communications fault. Data from 1<sup>st</sup> - 18<sup>th</sup> April have no valid calibrations and have been deleted, and the fault, developed into a permanent data loss.

commencing 18<sup>th</sup> April and CMCU no longer attempt to poll the site data. CMCU, QAQC Unit and the Environment Agency are considering the best way forward for this site.

### 3.3 Data Capture and Station-Specific Issues - Greater London

A summary of data capture for Greater London for April-June 2018 is given in Table 3-3:

**Table 3-3 Data Capture for Greater London, April-June 2018 (Quarter 2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Camden Kerbside		92.81		99.45	93.45		95.24
Ealing Horn Lane				99.91			99.91
Haringey Roadside		99.82					99.82
London Bexley		99.82			99.82		99.82
London Bloomsbury		99.91	99.95	99.04	97.44	88.78	97.02
London Eltham		95.65	99.77		96.25		97.22
London Haringey Priory Park South		99.68	99.63				99.66
London Harlington		85.58	99.54	97.44	97.44		95.00
London Hillingdon		94.64	99.86				97.25
London Marylebone Road	96.70	98.40	99.22	96.47	82.19	99.27	95.38
London Marylebone Road				89.01	85.71		87.36
London N. Kensington	99.54	99.68	99.68	100.00	100.00	95.15	99.01
London Teddington Bushy Park					96.93		96.93
London Westminster		99.77			95.33		97.55
Southwark A2 Old Kent Road		97.85		81.14			89.49
Tower Hamlets Roadside		93.96					93.96
Number of Stations	2	13	7	8	10	3	16
Number of Stations < 85 %	0	0	0	1	1	0	0
Number of Stations < 90%	0	1	0	2	2	1	2
Average	98.12	96.73	99.67	95.31	94.46	94.40	96.29

The following station-specific issues were identified:

#### **London Bloomsbury**

After problems experienced with the SO<sub>2</sub> analyser during Q4 2017 and Q1 2018, a hotspare was installed. However, the performance of this analyser was also unsatisfactory and was replaced again with the original analyser on 12 April. Data from 1<sup>st</sup> to 12<sup>th</sup> April were deleted by CMCU.

#### London Harlington

The NO<sub>x</sub> analyser was removed for workshop repair from 13<sup>th</sup> to 23<sup>rd</sup> May.

#### London Marylebone Road

On 17<sup>th</sup> June, the PM<sub>2.5</sub> FDMS analyser didn't respond to reboot following a power cut. The ESU attended to repair on 18<sup>th</sup> June, when the analyser was removed for workshop repair; reinstallation took place on the 22<sup>nd</sup>.

Both Partisols were also affected by the power cuts, resulting in instrument faults and filter exchange failures.

#### Southwark A2 Old Kent Road

The PM<sub>10</sub> data were noisy and erratic during May; data from 4<sup>th</sup> to 14<sup>th</sup> May have been deleted during ratification.

### 3.4 Data Capture and Station-Specific Issues - Wales

A summary of data capture for Wales for April-June 2018 is given in Table 3-4.

**Table 3-4 Data Capture for Wales, April-June 2018 (Quarter 2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Aston Hill		96.84	97.34				97.09
Cardiff Centre	99.86	98.72	99.77	99.27	99.95	99.77	99.56
Cardiff Newport Road		94.73		99.59			97.16
Chepstow A48		95.56		84.11	86.58		88.75
Cwmbran		99.86	99.91				99.89
Hafod-yr-ynys Roadside		98.90					98.90
Narberth		98.53	98.95	98.65		91.80	96.98
Newport		0.00		0.00	98.44		32.81
Port Talbot Margam (Partisol)				100.00			100.00
Port Talbot Margam	99.36	99.59	99.91	96.11	94.87	99.50	98.22
Swansea Roadside		99.77		98.44	88.19		95.47
Wrexham		99.36		98.90	97.80	0.00	74.02
Number of Stations	2	11	5	9	6	4	12
Number of stations < 85 %	0	1	0	2	0	1	2
Number of stations < 90%	0	1	0	2	2	1	3
Average	99.61	89.26	99.18	86.12	94.31	72.77	89.90



The following station-specific issues were identified:

#### **Chepstow A48**

Some PM<sub>2.5</sub> data were deleted due to noise, and some PM<sub>10</sub> due to being a regional outlier 4<sup>th</sup> to 8<sup>th</sup> May and 15<sup>th</sup> to 23<sup>rd</sup> May.

#### **Newport**

Although the NO<sub>x</sub> analyser was reinstalled in the new enclosure in May, a leak in the sampling system was found. The NO<sub>x</sub> data have been deleted to the ESU callout on 27<sup>th</sup> July. No PM<sub>10</sub> data for the quarter have been received at the time of writing (October 2018).

#### **Swansea Roadside**

On 8<sup>th</sup> June, there was a BAM tape issue and both tapes were replaced, but the PM<sub>2.5</sub> tape broke after replacement and was pending ESU investigation hence various tape issues between 7<sup>th</sup> and 15<sup>th</sup> June. The tape had run out again on 23<sup>rd</sup> June but it appears the tape had snapped again.

#### **Wrexham**

Concerns over the quality of the Wrexham SO<sub>2</sub> data were raised in Q1; however, in Q2 it was clear that the measured concentrations closely followed the measured site temperature. This was especially evident during the warmer weather. All Q1 and Q2 data have therefore been deleted, because it was clear that the data measured were being disproportionately affected by the ambient temperature.

## 3.5 Data Capture and Station-Specific Issues - Scotland

A summary of data capture for Scotland for April-June 2018 is given in Table 3-5:

**Table 3-5 Data Capture for Scotland, April-June 2018 (Quarter2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Aberdeen		99.59	99.91	97.07	99.63		99.05
Aberdeen Union Street Roadside		97.85					97.85
Aberdeen Wellington Road		99.86					99.86
Auchencorth Moss			99.63	94.51	97.16		97.10
Bush Estate		99.54	99.68				99.61
Dumbarton Roadside		99.63					99.63
Dumfries		99.68					99.68
Dundee Mains Loan		95.38					95.38
Edinburgh Nicolson Street		99.68					99.68
Edinburgh St Leonards	97.94	93.32	99.77	99.91	99.91	80.27	95.18
Eskdalemuir		99.91	92.26				96.09

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Fort William		99.86	98.26				99.06
Glasgow Great Western Road		99.91					99.91
Glasgow High Street		99.77		99.95	100.00		99.91
Glasgow Kerbside		99.45					99.45
Glasgow Townhead		99.95	99.91	95.47	92.45		96.94
Grangemouth		94.09		18.13	19.78	98.03	57.51
Grangemouth Moray		99.59					99.59
Greenock A8 Roadside		99.82		95.42	95.42		96.89
Inverness		99.68		84.62	100.00		94.76
Lerwick			97.76				97.76
Peebles		99.82	99.86				99.84
Strathvaich			99.68				99.68
Number of Stations	1	20	10	8	8	2	23
Number of Stations < 85 %	0	0	0	2	1	1	1
Number of Stations < 90%	0	0	0	2	1	1	1
Average	97.94	98.82	98.67	85.63	88.04	89.15	96.54

The following station-specific issues were identified:

#### **Edinburgh St Leonards**

As a result of a drifting baseline, the ESU was called out to the SO<sub>2</sub> analyser on 18<sup>th</sup> April. A blockage was found in the sample line; data from 1<sup>st</sup> to 18<sup>th</sup> April have been deleted.

#### **Grangemouth**

The FDMS PM data at this affiliate site was collected through the site Weblogger and the Local Authority decided to replace the logger with a different logging system to suit their own requirements. On 2<sup>nd</sup> April the ESU commenced the logger replacement, however, a variety of unforeseen complications forced the engineer to abort the installation on 4<sup>th</sup> April and data collection reverted to the original site Weblogger. All data were lost over this period.

On 20<sup>th</sup> April the ESU returned to site and on this occasion successfully installed the replacement logging system. However, at this point it was decided to transfer both PM monitoring systems to a dedicated communication package and this was completed the same day.

On 24<sup>th</sup> April CMCU requested the ESU installation of a complete hot spare system due to continuing concern over low mass concentration data. On 26<sup>th</sup> April the ESU installed a hot spare sensor and FDMS unit but retained the original control unit. The following day CMCU requested a further ESU visit due to perceived instrument response instability. The fault condition remained and on 8<sup>th</sup> May control unit replacement failed to resolve the performance issue. Finally, on 11<sup>th</sup> May the ESU reinstalled the original complete system. A significant improvement in response stability was observed and all data over this period were deleted due to the poor quality of the data.

The FDMS analysers were replaced by BAMs as part of the upgrade programme on 5<sup>th</sup> June.

### Inverness

The PM<sub>10</sub> Partisol suffered several filter exchange faults during this quarter, and an ESU callout identified irreparable damage to the sampler in early July. The planned replacement of both Partisols with a Fidas instrument was brought forward.

## 3.6 Data Capture and Station-Specific Issues - Northern Ireland & Mace Head

A summary of data capture for Northern Ireland, and Mace Head in the Republic of Ireland, for April-June 2018, is given in Table 3-6:

**Table 3-6 Data Capture for Northern Ireland (plus Mace Head), April-June 2018 (Quarter 2)**

Name	CO	NO <sub>2</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	Average
Mace Head			99.82				99.82
Armagh Roadside		95.74		99.86			97.80
Ballymena Antrim Road		90.75					90.75
Ballymena Ballykeel		99.82				65.48	82.65
Belfast Centre	95.56	95.47	99.82	94.46	99.82	99.68	97.47
Belfast Stockman's Lane		99.82		99.82			99.82
Derry Rosemount		99.91	99.91	100.00	100.00	94.87	98.94
Lough Navar			99.73	99.54			99.63
Number of Stations	1	6	4	5	2	3	8
Number of stations < 85 %	0	0	0	0	0	1	1
Number of stations < 90%	0	0	0	0	0	1	1
Average	95.56	96.92	99.82	98.74	99.91	86.68	95.86

The following station-specific issues were identified:

### Ballymena Ballykeel

An SO<sub>2</sub> instrument fault resulted in the loss of a significant quantity of data; no further information is available.

## 4 Changes to Previously Ratified Data

Occasionally there are circumstances where it is necessary to make changes to data which have previously been flagged as “Ratified”. This may be for example where:

- A QAQC audit or other investigation has detected a problem which affects data back into an earlier ratification period.
- Long-term analysis has detected an anomaly between expected and measured trends which requires further investigation and possible data correction.
- Further research comes to light which indicates that new or tighter QAQC criteria are required to meet the data quality objectives. This may require review and revision of historic calibration data by applying the new criteria.

During ratification of the 2018 Q2 data, some changes were also made to data from Q1 that had previously been flagged as ratified. These changes, and the reasons, are shown in **Error! Reference source not found.**

**Table 4.1 Changes Affecting Ratified Data in Previous Quarters**

Monitoring Station	Pollutant(s)	Dates	Nature of Change
Belfast Centre	PM <sub>2.5</sub>	15 <sup>th</sup> Feb – 14 <sup>th</sup> Aug 2018	Zero baseline correction between winter 2018 and summer 2018 zero tests.
Chilbolton Observatory	PM <sub>10</sub>	5 <sup>th</sup> Jan – 3 <sup>rd</sup> Jul 2018	Zero baseline correction between winter 2018 and summer 2018 zero tests.
Coventry Allesley	PM <sub>2.5</sub>	6 <sup>th</sup> Feb – 26 <sup>th</sup> Jul 2018	Zero baseline correction between winter 2018 and summer 2018 zero tests.
Glasgow Townhead	PM <sub>2.5</sub>	29 <sup>th</sup> Jan – 26 <sup>th</sup> Jul 2018	Zero baseline correction between winter 2018 and summer 2018 zero tests.
Edinburgh St Leonards	CO	All Q1 2018	Reprocess sensitivity (site cylinder was found to be > 10% out at summer audit).
Grangemouth Moray	NO <sub>x</sub>	Q1 2018	Deleted some rogue data points in Q1 and reprocessed zero baseline.
Immingham Woodlands Avenue	NO <sub>x</sub>	16 <sup>th</sup> Jan -31 <sup>st</sup> Mar 2018	Sampling fault
Liverpool Speke	NO <sub>x</sub>	Q1 2018	Baseline adjustment.
Plymouth Tavistock Road	NO <sub>x</sub>	Q1 2018	Baseline adjustment.
Preston	NO <sub>x</sub>	Mar 2018	Some reprocessing of zero baseline needed.
Reading London Road	NO <sub>x</sub>	Q1 2018	Baseline adjustment.
Sheffield Devonshire Green	PM <sub>10</sub>	16 <sup>th</sup> Jan – 23 <sup>rd</sup> Jul 2018	Zero baseline correction between winter 2018 and summer 2018 zero tests.

Monitoring Station	Pollutant(s)	Dates	Nature of Change
Storrington Roadside	NO <sub>x</sub>	Q1 2018	Review baseline processing: possible adjustment.
Wrexham	SO <sub>2</sub>	Q1 2018	Data rejection (see Table 1 above).

## 5 Health and Safety Report

There were no instances when an AURN station went to 'HIGH' risk status during the quarter.

## 6 Equipment Upgrade Requirements

A programme of upgrades of FDMS to BAM and Fidas instruments is underway during 2018. Details of the instruments replaced in Q2 of 2018 have been provided in section 1.4 above.

## 7 Station Infrastructure Issues

No station infrastructure issues have been identified by the QAQC Unit this quarter.

## 8 Conclusions and Recommendations

1. During Quarter 2 of 2018 a total of 170 monitoring stations at 168 locations were in operation. The total of 170 includes two stations where Partisol gravimetric particulate samplers are co-located with automatic particulate analysers.
2. During this quarter, the Spring 2018 intercalibration exercise was carried out, involving calibration of every ozone analyser in the network. This allows the accuracy of the measured results to be determined, and a measurement uncertainty for each analyser to be determined, as required by the Data Quality Objective.
3. Data ratification for the quarter was completed by the deadline of 30<sup>th</sup> September 2018.
4. The mean data capture for ratified hourly average data was 94.37% (averaged over all pollutants O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>), for the three-month reporting period January to March 2018. Mean data captures for individual pollutants were as follows: CO 98.40%, NO<sub>2</sub> 95.38%, O<sub>3</sub> 97.95%, SO<sub>2</sub> 90.65%, PM<sub>10</sub> 90.54%, and PM<sub>2.5</sub> 94.45%. The data capture target of the Air Quality Directive is 90% excluding periods of planned maintenance e.g. calibrations, audits and servicing). An allowance of 5% is made for this, hence a target of 85%. The mean data captures for all pollutants met this target in Quarter 2 of 2018.
5. The input from the CMCUs in producing this report is gratefully acknowledged.





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